

2001 Trial Transcripts Part 3

[2] For sensing a value of predetermined [3] flow-related parameter within said duct means, [4] that sensing value is used in the flow parameter, [5] which I showed you earlier, that sensing means [6] refers to this value here, this is the pressure [7] means value for the generation of this term, which [8] is a function of flow.

[9] Q: Let me just stop you, this value here, [10] you're referring to PS on —

[11] A: It's on PTX 954.

[12] Q: And then this value here, which was a [13] function of flow, you were circling the DELPQP?

[14] A: That's correct. I'm sorry if I went a [15] bit too fast there.

[16] Q: No. I want to make sure the court [17] reporters have a record of what's happening.

[18] A: Yes. I was referring to what is called [19] DELPQP which is a — which is a value which is [20] generated from delta P divided by PS, the [21] discharge pressure measured, which is referred to [22] here as a sensing means.

[23] Q: Okay. And the last part of Claim D, [24] Part D of Claim 8 says "said value of said

Page 665

[1] flow-related parameter being substantially [2] independent of the temperature of the compressed [3] air.

[4] Is that part also met by the APS [5] 3200?

[6] A: Yes, the value of the pressure measured [7] here — sorry. The value, the value of the [8] pressure measured here is independent of [9] temperature.

[10] Q: And when you say "here", you're pointing [11] to what I think you have identified as the duct [12] flow, the bleed control valve on PTX 952?

[13] A: Yes, it's the general area around the [14] discharge of the compressor.

[15] Q: Okay. The next part of Claim 8 reads, [16] "compare for means for receiving said sensing [17] means output signal and generating an error signal [18] representing the difference between the incensed [19] value of said parameter and a desired value [20] thereof, said comparator means having an [21] adjustable control set point representing said [22] desired value of said parameter."

[23] A: Yes.

[24] Q: Is that met by the APS 3200?

Page 666

[1] A: Yes, it is. And this is the comparator [2] that it's referring to in this particular case. [3] And what it's measuring here is the said [4] parameter, I believe, is the flow parameter, and it [5] is comparing it

against the point here and — and [6] this is — and this is where the comparing [7] function occurs.

[8] Q: I think on the demonstrative we have left [9] off one word. The word parameter was in the end [10] of the claim.

[11] A: Yes.

[12] Q: I take it the said parameter is the rest [13] of Claim E?

[14] A: As I recall, that was the same set [15] parameter as said earlier in that sentence, yes.

[16] Q: The text part of Claim 8 reads, "means [17] for transmitting to said comparator means a reset [18] signal for varying said set point as a function of [19] the position of said inlet guide vanes in [20] accordance with a predetermined reset schedule."

[21] Let me ask you if you believe that [22] part of Claim 8 is met either literally or [23] equivalently by the APS 3200 surge control system?

[24] A: I believe that's met equivalently.

Page 667

[1] Q: Okay. And can you explain to the jury [2] the basis for that opinion?

[3] A: Well, it says means for transmitting to [4] said comparator a reset signal for varying said [5] set point as a function of the position of said [6] inlet guide vanes.

[7] Well, a means is a device which is [8] mounted right on the inlet guide vane and as it [9] rotates, it generates a value which is a [10] percentage of it opening and closing. And that's [11] what it refers to as the means.

[12] And then a means for transmitting [13] said comparator means for a said — I'm sorry. I [14] should speak more slowly. And that value is then [15] in turn — and that inlet vane, vane position is [16] then, in turn — then, in turn, is used in this [17] equivalent comparator for setting a high or low [18] flow.

[19] Q: When you say this equivalent comparator, [20] you're referring to the BLDSEL thing?

[21] A: Referring to the area just prior, the [22] actual generation, the actual item which generates [23] the BLD select signal.

[24] Q: Let me ask you, in your opinion, what is

Page 668

[1] the function being served in Claim 8 of the '893 [2] patent by the claim term of means for transmitting [3] to said comparator means a reset signal, et [4] cetera?

[5] What's the function of Part F of [6] Claim 8?

[7] A: Well, I believe I might have men-

tioned [8] that earlier. If I didn't, I thought I had.

[9] It was the actual — I believe it [10] was the generation of the signal that — means [11] are the — the means are actual device on the [12] IGV, which is — that is the means for [13] transmitting the value to the said comparator, [14] yes.

[15] Q: Okay. Let me ask you to take a step back [16] and ask what is the function that is being served [17] in the patented system by Step 8 of Claim 8 of [18] the — Step F of Claim 8 of the '893 patent?

[19] A: What it serves to do is to determine, is [20] to establish for the surge control system and tell [21] it when it's in high or low flow.

[22] Q: Okay. And what is the function in the [23] APS 3200 of the measurement?

[24] A: The function in the APS 3200 of the

Page 669

[1] measurement is to determine — is to — it [2] utilizes this information to — in relationship — [3] in order to tell the surge control system, to tell [4] the surge control system when — when — in order [5] as part of the surge control to tell it when it is [6] operating in high flow, and when it is operating [7] in low flow.

[8] Q: And what is the way that the patent — [9] Claim 8f, what is the way that it uses that [10] information to serve that function?

[11] A: It uses the function to make a [12] determination — that's how you — which then is [13] used in — it goes back to our earlier chart.

[14] Q: And you're putting up now PTX 953?

[15] A: Yes, I believe that's what it is.

[16] This goes back to what we talked [17] about earlier, where basically the actual, the [18] actual flow and the generation of this BCV control [19] signal, the IGV position is then used to actually [20] determine, as I just indicated, when it's in high [21] or low flow, which eventually generates the actual [22] control signal for the bleed control valve.

[23] Q: What is the result of the patents used in [24] Claim F of the inlet guide vane position?

Page 670

[1] A: It is used in the control of the surge [2] control system.

[3] Q: Do you have an opinion as to whether the [4] function, way and result of Claim 8f is identical [5] to the function, way and result of the use of the [6] inlet guide vane position in the APS 3200 surge [7] control system?

[8] A: Yes.

[9] Q: And what is that opinion?

[10] A: Yeah, I believe it's equivalent to it.
[11] Yes.

[12] Now, let me ask you to go to the
[13] part of Claim 8, or to put up —
I guess we [14] have got two parts left
that Sundstrand admits.

[15] The next one is "control means for [16]
receiving said error signal and trans-
mitting to [17] said surge bleed means a
control signal to operate [18] said surge
bleed means, the magnitude of said [19]
control signal having, relative to the
magnitude [20] of said error signal, a
proportional component and [21] an
integral component."

[22] Is that met in the APS 3200?

[23] A: Yes. Yes it is.

[24] And it's met in this chart again,

Page 671

[1] working it through item by item. We
refer, again, [2] to the pressure value, the
flow parameter value, [3] which com-
pares it against a set point which [4]
generates an error. There is an error
signal [5] indicated here which then —
and then it goes [6] through the pro-
portional and integral controller, [7]
which eventually results in the control
of the [8] bleed control valve.

[9] Q: Okay. And the final part of Claim 8
the '893 patent reads, "whereby
inimum flow [11] rate through said
means is essentially [12] constant
regardless of the compressed air supply
[13] demand of the pneumatically-powe-
red apparatus."

[14] Can I ask you whether that is [15]
present in the APS 3200 surge control
system?

[16] A: Yes, it is.

[17] Q: Can you show where that is pre-
sent?

[18] A: As in other claims, it's present in
this [19] portion here, where the min-
imum no rate is [20] maintained by use of
this valve to — by [21] altered — by
moving the air to the aircraft and [22] to
the exhaust in equal portions that are
such [23] that you maintain a constant
flow going through [24] the compressor.

Page 672

[1] MR. PUTNAM: And let me ask [2] Mr.
Schlaifer to turn to all of Claim 8.

[3] BY MR. PUTNAM:

[4] Q: Now that we've gone through
each part of [5] Claim 8, do you have — let
me just ask you again [6] to state your
opinion on whether Claim 8 of [7]
Honeywell's '893 patent is met by the
[8] APS 3200 surge control
system?

[9] A: Yes.

[10] Q: Now, let me turn to the next claim,
which [11] is in dispute in this case, and

that is Claim 10 [12] of the '893 patent.

[13] Claim 10 looks to be a little bit [14]
shorter than Claim 8, because as the jury
would [15] see if they looked at the actual
patents in the [16] book, this is the full
length of Claim 10.

[17] Claim 10 reads, "the accessory power
[18] unit of Claim 8 wherein said control
means include [19] parallel proportional
and integral controllers [20] coupled to a
summer having an outlet connected to
[21] said surge bleed means."

[22] First of all let me ask you about [23] the
form of the claim there. There is a
reference [24] at the start of Claim 10 to
Claim 8. What's that

Page 673

[1] about?

[2] A: Well, what I understand that to
mean is [3] that Claim 10, everything in
Claim 8 is — Claim 8 [4] is part of Claim
10.

[5] Q: So is it your understanding that [6]
Claim 8 — Claim 10 includes everything
in Claim 8 [7] and then an additional
element?

[8] A: Yes.

[9] Q: And I think there may have been a
[10] reference to something earlier called a
dependent [11] patent claim.

[12] Is it your understanding that [13] Claim
10 is an example of a dependent patent
[14] claim?

[15] A: That's what I understand.

[16] Q: And just for the terminology, it is
[17] dependent on Claim 8; is that your
understanding?

[18] A: That's what that term implies.

[19] Q: Now, we already did Claim 8, so I
just [20] want to focus here on your
opinion on Claim 8 [21] itself.

[22] Let me just focus here on the new [23]
material that is added by Claim 10, which
is, [24] "wherein said control means
include parallel

Page 674

[1] proportional and integral controllers
coupled to a [2] summer having an outlet
connected to said surge [3] bleed means."

[4] Is that present on the APS 3200?

[5] A: Yes, it is.

[6] Q: And can you show the jury where
that's [7] present?

[8] A: It's present here and here. I believe
[9] the difference earlier is that it referred
to [10] these individually, and here it's
basically saying [11] that they are coupled
in parallel, which is what [12] these black
lines are showing, which then goes to [13]
a summer, where they are sum, and that
generates [14] the surge, the surge bleed
means which is shown [15] here.

[16] Q: Okay. The next part of Claim 10 —

I'm [17] sorry, the next patent claim at
issue is Claim 11 [18] of Honeywell's '893
patent. And let me ask [19] Mr. Schlaifer to
put that up on the board.

[20] Claim 11 of the '893 patent reads, [21] "
the accessory power unit of Claim 8
wherein said [22] sensing means include
at least one [23] pressure-to-electric trans-
ducer, and said [24] comparator means
and said control means comprise

Page 675

[1] electronic components."

[2] Again, this is a — let me ask you [3] this
question. In your opinion, is this claim
met [4] by the APS 3200 surge control
system?

[5] A: Yes, it is.

[6] Q: Again, it's dependent on Claim 8; is
that [7] your understanding?

[8] A: That's my understanding as before.

[9] Q: And we've already dealt with your
opinion [10] on Claim 8, and its in-
fringement, so let me [11] address the new
part added by Claim 11.

[12] The new part added by Claim 11
reads [13] "wherein said sensing means
include at least one [14] pressure-to-elec-
tric transducer and said [15] comparator
means and said control means comprise
[16] electronic components."

[17] Why is that present in the APS 3200?

[18] A: Well, as indicated earlier, the pre-
ssure [19] sensors, the pressure sensor is
actually a device [20] which is screwed
into the duct itself, the [21] discharge as
one example, where it takes the [22]
pressure reading.

[23] It then converts that pressure [24]
reading into an electrical signal which
can be

Page 676

[1] used within the computer, because
computers can [2] only use electrical
signal. So that's one example [3] of it.

[4] And as far as the remainder of it, [5] this
as I indicated before, all of this is done [6]
electronically. And in fact, the actual
document [7] itself is referred to as —
make sure I get the [8] terminology right,
the electrical control box.

[9] Q: Okay. That takes care of Claim 11 of
[10] Honeywell's '893 patent.

[11] We have two patent claims left that
[12] are at issue, Claims 19 and 23. I
wonder, Your [13] Honor, if I could have a
brief side-bar with you [14] before we
proceed to those claim terms.

[15] (Beginning of side-bar conference.)

Page 677

[1] MR. PUTNAM: Your Honor, [2] Mr. Mul-
ler, the reason for the side-bar, I [3]
apologize for this, is to see if we can take
the [4] lunch break fifteen minutes ear-

lier.

(5) Mr. Muller has been on his feet all (6) day. I don't know if he's hypoglycemic. When we (7) have been working with him, we have to feed him (8) lunch early because he starts losing energy. It's (9) important stuff, so with your permission, I would (10) like to end fifteen minutes early.

(11) (Conclusion of side-bar conference.)

(12) **THE COURT:** We're going to take our (13) luncheon recess a bit early today. We will break (14) now and return at two p.m.

(15) See you then.

(16) **MR. PUTNAM:** Thank you, Your (17) Honor.

(18) (A brief recess was taken.)

(19) **THE COURT:** Counsel please be (20) seated.

(21) **MR. KRUPKA:** Your Honor, two (22) housekeeping matters that I just wanted to mention (23) to the Court before you reviewed some things over (24) the lunch hour.

Page 678

(1) In view of Your Honor's ruling this (2) morning with respect to the deposition (3) designations that we were hoping to read later (4) this afternoon, about which there is still some (5) dispute, I just wanted to mention that I believe (6) it's true that Mr. Van Santen, who is one of the (7) deposition designations in dispute, will be a live (8) witness.

(9) **THE COURT:** Well, I'm glad you (10) raised that issue because I had intended to (11) address the substance of the letters of February (12) 6th.

(13) **MR. KRUPKA:** Okay.

(14) **MR. ZIEGLER:** Just before you rely (15) on what Mr. Krupka said —

(16) **THE COURT:** Whether he is or whether (17) he's not, it doesn't matter.

(18) **MR. ZIEGLER:** Okay.

(19) **THE COURT:** What the Court has (20) before it are Honeywell's objections to (21) Sundstrand's objections to certain deposition (22) designations. And I guess what I'm going to do is (23) sustain Honeywell's objections to the objections.

(24) **MR. KRUPKA:** Thank you, Your Honor.

Page 679

(1) **THE COURT:** As a matter of form, (2) There will be — it is the core's (3) view that these are issues of weight, and not (4) questions of admissibility. And that you, (5) Hamilton, have ample opportunity through argument (6) and cross-examination to refute the contentions, (7) direct or indirect, that Hamilton seeks to have (8) the inferences that Hamilton

seeks to have drawn (9) specifically, for instance, through the testimony (10) of the designations of Mr. Van Santen.

(11) And that's the Court's ruling.

(12) **MR. KRUPKA:** Your Honor, just one (13) other point of clarification. Since this is my (14) first trial before this Court, I just want to make (15) sure that I am complying with the Court's wishes (16) with respect to how things are conducted.

(17) It was my understanding that one (18) lawyer deals with each witness, one lawyer for (19) each side, and that we don't have a tag team. I (20) was a little surprised to hear Mr. Ziegler (21) interpose an objection during Mr. Muller's (22) testimony, because I had thought that it was (23) Mr. Herrington who had made previous objections.

(24) And I just would like to have a

Page 680

(1) clarification to that for future reference.

(2) **THE COURT:** That's a fair point and (3) that is a point that we didn't go over earlier, so (4) there was nothing improper that was done. It is (5) the Court's preference that one lawyer handle a (6) witness.

(7) **MR. ZIEGLER:** Your Honor, just to (8) explain, I actually didn't object, I simply asked (9) that the record be clarified to show where the (10) witness had put his hand on the chart.

(11) Mr. Herrington was seated at the (12) counsel table, only I was standing to the side and (13) saw what was going on.

(14) **THE COURT:** I think your opponent (15) took it as objection, I understand the (16) clarification, I hope the clarification has she (17) had.

(18) **MR. KRUPKA:** Thank you, Your Honor.

(19) **THE COURT:** Anything else we need to (20) discuss before we adjourn to take lunch?

(21) **MR. KRUPKA:** I don't think so, Your (22) Honor.

(23) **THE COURT:** See you back at 2:00.

(24) (A brief recess was taken.)

Page 681

(1) **THE COURT:** Good afternoon.

(2) **MR. KRUPKA:** Good afternoon.

(3) **THE COURT:** We're ready.

(4) **MR. KRUPKA:** Your Honor, if I may (5) just hand to Ms. Preston some additions to the (6) juror notebook that will be necessary before the (7) depositions are shown. There is two — there is (8) request for admissions that Exhibit 2.

(9) (Jury entering the courtroom at (10) 2:00 p.m.)

(11) **THE COURT:** Good afternoon, mem-

bers (12) of the jury. Are you all ready to go? Okay.

(13) **THE CLERK:** Mr. Muller, you're still under oath. You may resume stand.

(15) **THE COURT:** Mr. Putnam.

(16) **MR. PUTNAM:** Thank you, Your (17) Honor.

(18) **BY MR. PUTNAM:**

(19) **Q:** Mr. Muller, why don't you stay off the (20) stand because I think we are going to do a little (21) bit more of what we were doing.

(22) Before lunch we went through your (23) opinions on literal infringement of Claim 4 of the (24) '94 patent and infringement under the doctrine

Page 682

(1) of equivalence on Claims 8, 10 and 11 of the '893 (2) patent and that left two patent claims that are at (3) issue in this case that we didn't have a chance to (4) go through, through lunch.

(5) I think we'll see some familiar (6) concepts. I don't know how long it will take, but (7) we need to go through those.

(8) Let me ask you about Claim 19 of the (9) '893 patent and ask Mr. Schlaifer to put it up.

(10) Mr. Muller, have you formed an opinion on whether the surge control system used (12) by the APS 3200 fringes claim 19 of the '893 (13) patent?

(14) **A:** Yes, I have.

(15) **Q:** And what is that opinion?

(16) **A:** And that opinion is that it does (17) infringe, yes.

(18) **Q:** And is that infringement literal or under (19) the doctrine of equivalence in your view for this (20) claim 19?

(21) **A:** I believe it's under the doctrine of (22) equivalence.

(23) **Q:** Again, let me ask you to walk through (24) each step of the claim, starting with the first

Page 683

(1) part. And the first part of claim 19 reads, "A (2) control system for assuring a substantially (3) constant minimum flow rate through a duct (4) receiving air discharged from a compressor or the (5) like having adjustable inlet guide vanes.

(6) Why don't you put up whatever chart (7) you want to.

(8) **A:** I'm putting up Honeywell PTX 952.

(9) **Q:** And can you — I take it from your (10) earlier answer that you believe the 3200 does (11) meet this part of Claim 19; is that correct?

(12) **A:** Yes, it does.

(13) **Q:** And can you show where that is,

please?

[14] A: As in the prior case as similarly, the actual constant minimum flow is maintained at the [16] discharge of the compressor.

[17] The duct receiving is what is shown [18] here, has been shown throughout receiving air [19] discharged from a compressor or the like having [20] adjustable inlet guide vanes and that refers to [21] this compressor which was adjustable guide vanes.

[22] Q: The next part of claim 19 of the '893 [23] patent reads, "The duct having a supply outlet [24] connect to do a pneumatically-operated apparatus

Page 684

[1] having a variable supply air demand, the duct [2] further having an exhaust outlet, said control [3] system comprising."

[4] Is that part present in the APS [5] 3200?

[6] A: Yes, it is.

[7] Q: Can you tell the jury, please?

[8] A: Yes. The duct it's referring to is here [9] of course which we did previously, which is the [10] duct having the supply outlet connected to a [11] pneumatically operated apparatus having a variable [12] supply air demand, that leading to the aircraft [13] environmental control system.

[14] The duct further having an exhaust [15] outlet which generally constitutes this portion as [16] well.

[17] Q: Okay. The next part of Claim 19 of the [18] '893 patent, I see is, one that Sundstrand expert [19] admits yes or is, "A flow regulating device [20] adapted to be positioned enter the exhaust outlet [21] and operable to selectively vary air flow [22] outwardly there through." Is that present in the [23] claim?

[24] A: Yes.

Page 685

[1] Q: The next part of claim 19 reads, "a [2] sensing device having a sensing portion adapted to [3] be positioned in the duct to sense therein a [4] predetermined parameter related to the air flow [5] rate through the duct, said sensing device further [6] having an output portion."

[7] Is that present in the APS 3200?

[8] A: Yes, it is.

[9] Q: Can you show where, please, it is?

[10] A: As I indicated earlier, in the discharge [11] portion of the compressor pressure sensor [12] is utilized in measure a parameter, which [13] is associated with the flow rate.

[14] Q: Okay. The next portion of Claim 9 [15] reads, "An adjustable set point comparator having [16] an input portion

couple to said output portion of [17] said sensing device, and an outlet adapted to [18] generate an error signal."

[19] Is that present in the APS 3200 [20] system?

[21] A: Yes, it is. And that's illustrated on [22] Honeywell PTX 954. Let's just go through that a [23] moment. An adjustable set point comparator which [24] refers to this, this signifies a comparator.

Page 686

[1] The adjustable set point arrives [2] from SRGSPT, coupled to output portion of said [3] sensing device, this is the output portion of the [4] said sensing device which is the change in [5] pressure over pressure which measures flow and an [6] outlet adapted to generate an error signal, and [7] here is the error signal emanating from the [8] comparator.

[9] Q: The next portion reads, a proportional [10] controller having an inlet coupled to said output [11] of said comparator and further having an outlet."

[12] Is that present in the APS 3200?

[13] A: Yes. And all that is saying is that [14] continuing on, that this connects to the [15] proportional controller and that in turn has an [16] outlet as well, it comes out through here.

[17] Q: Okay. The next part of Claim 19 of the [18] '893 patent reads, "An integral controller having [19] an inlet coupled to said outlet of said comparator [20] and further having an outlet."

[21] Is that present in the APS 3200?

[22] A: Yes, it is. It is in the same way that [23] the proportional controller was the integral [24] controller, also has the inlet coupled to the set

Page 687

[1] comparator, and it also has an outlet as well.

[2] Q: Okay. The next part of Claim 19 of the [3] '893 patent, part F says, "A summer having a [4] first inlet coupled to said outlet of said [5] proportional controller, a second inlet coupled to [6] said outlet of said integral controller, and an [7] outlet coupled to said flow regulating device."

[8] Is that present in the APS 3200?

[9] A: Yes, it is.

[10] Q: Can you show the jury where it is?

[11] A: And that basically completes the thought [12] of where the outlet here, the outlet from the [13] integral controller and the outlet from the [14] proportional controller complete a summer, sums [15] both signals to generate one signal and that's [16] what "coupled" really means.

[17] And then it goes off to direct the [18] flow regulating device which is the signal [19] generated here, this is the

BCVCTL. It's a signal [20] that goes to the bleed control valve to regulate [21] it.

[22] Q: The final part of Claim 19 of the '893 [23] patent reads, "A guide vane position sensor and a [24] function generator coupled in series between the

Page 688

[1] inlet guide vanes and said input portion of said [2] comparator."

[3] In your opinion, is that portion of [4] Claim 19 present in the APS 3200?

[5] A: Yes, it is.

[6] Q: And is it your opinion that that is [7] literally present or present by the doctrine of [8] equivalence?

[9] A: I believe it's present by the doctrine of [10] equivalence.

[11] Q: Can you show, please, the jury, the basis [12] for that belief, that opinion?

[13] A: I'm placing Honeywell PTX 955 up for [14] illustration.

[15] And basically here this is [16] illustrated by the measurement of the IGV [17] position, the guide vane position sensor is here. [18] This is the function generator that it goes [19] through, and it's between inlet guide vanes and [20] the inlet portion to a said comparator and here is [21] the said comparator.

[22] Q: What is the function that is being served [23] by the guide vane position sensor and the rest of [24] clause G of Claim 19 of the '893 patent?

Page 689

[1] A: The function is to identify a guide vane [2] position in order to help in the control of the [3] surge control system.

[4] Q: What is the function of the inlet guide [5] vane position sensor and the other elements that [6] you've identified to the chart that we've labeled [7] plaintiffs Exhibit 955?

[8] A: The purpose here is to measure the guide [9] vane position in order to help to, as input to the [10] surge control system.

[11] Q: What is the way in which the sensor in [12] Claim 19 G works?

[13] A: The sensor in 19 G, the sensor, the [14] sensor on the — the sensor on the Honeywell — [15] I'm sorry, the sensor on the patent. — The [16] sensor on the patent refers to a device which I've [17] referred to earlier which is at the end of the [18] inlet guide vane which measures the position and [19] generates a signal which is relative to the [20] position of the guide vane.

[21] Q: Okay. And how does the guide vane [22] position sensor and the other elements in the APS [23] 3200 work? What is the way in which they work in [24] the APS 3200?

Page 690

[1] A: On the APS 3200, the vane position is [2] measured in the same way. As the vane position [3] moves, there is a device which determines its [4] position and generates a signal proportional to [5] the signal of the guide vane.

[6] Q: And what's the result in the patent of [7] the use of this guide vane position sensor that's [8] called out in Claim 19 G?

[9] A: The — it is used in the operation of the [10] surge control system.

[11] Q: Okay. And what's the result of the guide [12] vane position sensor that is shown in the Hamilton [13] Sundstrand APS 3200 system?

[14] A: It's the same thing, the value of the IGV [15] position is used in the proper operation of the [16] surge control system.

[17] Q: Mr. Schlaifer if you can go to the final [18] screen on Claim 19. Now, that we've gone through [19] all of Claim 19, let me ask you for the record to [20] restate, now that we've seen it all, what is your [21] opinion on whether the Hamilton Sundstrand APS [22] 3200 infringes Claim 19 of the '893 patent?

[23] A: I believe it does infringe.

[24] Q: Finally for the patent claims, let me

Page 691

[1] turn to Claim 23 of the '893 patent. A welcomed [2] relief in terms of its length. It says "The [3] control system of Claim 19 wherein said control [4] system is electronic."

[5] First of all, is this another one of [6] those dependent claims that we saw earlier?

[7] A: Yes, as I indicated earlier, this is [8] another dependent claim.

[9] Q: So I think what you said earlier was this [10] incorporates all of the limitations, all of the [11] different elements of Claim 19 that we were just [12] looking at and then adds one additional element; [13] correct?

[14] A: Yes. The same thing is done here as was [15] done in the former claims wherein there was a [16] dependent claim based on a claim that was [17] mentioned in the actual claim itself.

[18] Q: Okay. Well, we've already covered all [19] the parts of Claim 19, that's what we just did. [20] Let me ask you about this new part added by claim [21] 23. Wherein said control system is electronic. [22] Is that met by the APS 3200?

[23] A: Yes, it certainly is. The entire [24] operation of the APS 3200 is based on electronic.

Page 692

[1] instruments, or concepts, concepts and logics and [2] devices.

[3] Q: I'm now taking you through your opinions [4] on doctrine of equivalence under the '893 patent. [5] I want to return, if I can, to Claim 4 of the '194 [6] patent.

[7] And you previously testified to your [8] opinion that Claim 4 of the '194 patent was [9] literally infringed; is that correct?

[10] A: That's correct.

[11] Q: All right. Now, let me ask you this [12] question, Mr. Muller. If it was determined that [13] Clause D of Claim 4, if this clause, Clause D, was [14] not literally present in the APS 3200, would you [15] have an opinion as to whether this clause, this [16] part was present by the doctrine of equivalence in [17] the APS 3200?

[18] A: Well, as I said, yes, the answer — yes, [19] I would.

[20] Q: And what would the opinion be, sir?

[21] A: And my opinion would be as it was [22] formally, that if I believe that this was in fact [23] a literal infringement, and for some reason it [24] should be shown not to satisfy the strict, the

Page 693

[1] strict interpretation of what a — an allege [2] infringement is, by my logic, by my reasoning it [3] would certainly infringe on the basis of [4] equivalence.

[5] Q: What is the function of this adjustment, [6] just of the relationship that is called out in [7] Clause D of Claim 4 of the patent?

[8] A: The function of that is to aid in the [9] operation, is to allow the proper operation of the [10] surge control system.

[11] Q: Okay. And what is the function of the [12] relationship between the control signals and the [13] parameter variations as a function of the guide [14] vane positions in the APS 3200?

[15] A: The function there is in order to [16] establish if the APS 3200 is operating under a [17] high flow condition or a low flow condition.

[18] Q: And what is the way in which the APS 32 [19] — what is the way in which Claim 4 of the '194 [20] patent adjusts that relationship?

[21] A: It adjusts that relationship as was [22] formally shown — it adjusts — the relationship, [23] this relationship here, this relationship here, [24] which is the proportional and the integral

Page 694

[1] portion, this relationship here, is adjusted by the [2] IGV position in such a way that it determines — [3] that that it determines — it determines if the [4]

compressor is operating under high or low flow [5] condition.

[6] Q: And what is the result of the adjustment [7] of the relationship of magnitudes set forth in [8] Claim 4 D of the '194 patent?

[9] A: The result of it is to, as I said [10] earlier, basically, it's to allow the surge [11] control system to properly operate from the [12] standpoint of that it provides it with an ability [13] to control the — to control the compressor when [14] it is operating in an area where surge is [15] possible, and also at the same time when the [16] compressor is in a high flow rate, at the help in [17] determining when it's in the high flow regime [18] where no surge is possible.

[19] Q: Is that the same result as occurs at the [20] APS 3200 surge control system?

[21] A: Yes.

[22] Q: Thank you. Why don't you go ahead and [23] resume the stand now. And I guess just let me ask [24] the final question having gone through that. —

Page 695

[1] Why don't you resume the stand.

[2] So in summary, is it your opinion [3] that to the extent that it's determined that Claim [4] 4 of the '194 patent is not literally infringed [5] that there would still be infringement under the [6] doctrine of equivalence?

[7] A: Yes, for the reasons I cited earlier.

[8] Q: Thank you.

[9] There has been some mention of this [10] issue of temperature. Does the APS 3200 measure [11] temperature?

[12] A: Yes, it measures temperature among the [13] whole series of other measurements, such as [14] pressure, pressure IGV and so on.

[15] Q: Does that measurement affect your opinion [16] as to whether there is infringement of the [17] Honeywell patent as we've just gone through?

[18] A: No.

[19] Q: Why not?

[20] A: Well, because the Honeywell patent, and [21] the APS 3200 both, or the APS 3200 measures the [22] same things that are measured by the Honeywell [23] patent. The fact that it may measure other things [24] as well is perfectly — is perfectly reasonable.

Page 696

[1] but as long as it measures the same things as are [2] measured in the Honeywell patent, my understanding [3] that that means, in fact, it is infringing.

[4] MR. PUTNAM: Thank you, Your [5] Honor. No further questions.

[6] THE COURT: Mr. Herrington, you may

[7] cross-examine.

[8] MR. HERRINGTON: Thank you, Your Honor. Could we have the Claim 4 right back up [10] that Mr. Muller was talking about?

[11] Your Honor, if I may ask Mr. Muller [12] to step down so we can review some of these charts [13] that we have been looking at.

[14] THE COURT: Certainly.

[15] MR. HERRINGTON: Thank you.

[16] MR. PUTNAM: Your Honor, do you [17] mind if I stand back there in order to see?

[18] THE COURT: That's fine.

[19] MR. PUTNAM: If Your Honor doesn't [20] mind, I suspect Mr. Herrington won't mind.

[21] MR. HERRINGTON: Not at all [22] CROSS-EXAMINATION [23] BY MR. HERRINGTON:

[24] Q: So, Mr. Muller, you understand that

Page 697

[1] element D requires adjusting the relationship [2] between the magnitude of said integral and [3] proportional control signals and the magnitude of [4] said proportional control signals as a management [5] function of the inlet vanes?

Yes.

[7] Q: You said that occurs in the 3200 in that [8] in the guide vane position affects whether this [9] bleed select signal is zero or one?

[10] A: That's right.

[11] Q: So is it the switching between zero and [12] one that adjusts the relationship between the [13] magnitudes of said integral and proportional [14] control signals and the magnitudes of said [15] parameter variations?

[16] A: That's not the way I think of it. The [17] way I think of it is that it is basically what is [18] being done here, is that the proportional and [19] integral control signals are being continuously [20] generated. And they get generated regardless if [21] the compressor is in high or low flow.

[22] But where the IGV position is used [23] here is that because of the characteristics of the [24] APS 3200, it has an additional step, and — what

Page 698

[1] it does is it establishes a fixed position for the [2] bleed control valve under a [3] low condition.

[4] Nevertheless, the proportional — [5] and the proportional integral control signals [6] continue to be generated but now what you have [7] done is you have changed the magnitudes of those [8] as

far as the surge control system is as [8] established by the position of the IGV's.

[9] Q: In your understanding, the test that uses [10] IGV position changes the magnitudes of the PI [11] signal?

[12] A: As far as the surge control system [13] operates and as far as I understand it.

[14] Q: So it has a different magnitude depending [15] on the IGV position?

[16] A: As far as the bleed control valve is [17] concerned, yes.

[18] Q: And that's the understanding of the facts [19] that you have been using in doing your analysis?

[20] A: The explanation I just gave I think is [21] consistent with what I have said throughout the [22] morning and part of this afternoon.

[23] Q: Very good.

[24] Now, Mr. Muller, again, IGV position

Page 699

[1] has an affect on whether this bleed select signal [2] is zero or one; is that correct?

[3] A: Yes, that's correct.

[4] Q: And all of the things you've said about [5] what happens in the 3200 with respect to IGV [6] position and how it satisfies the patent claims, [7] that goes to IGV position changing the signal [8] between zero and one?

[9] A: No. It actually has to do with the fact [10] that as far as the proportional and integral, the [11] magnitude of those and as they impact on the bleed [12] control valve. So all I'm saying is that the IGV [13] position controls, has direct impact on the bleed [14] control valve by modifying the magnitudes of the [15] proportional and integral controls.

[16] Q: Which way does it modify them, does it [17] make them bigger or smaller?

[18] A: No, as I said earlier, the value [19] continues but what it does do is it imposes a [20] fixed value, a high flow because of the [21] characteristics that, the characteristics of this [22] compressor, so it has an additional — it has an [23] additional capability in order to set the bleed [24] control valve open so that all the flow goes to

Page 700

[1] the aircraft.

[2] Q: And Mr. Muller, does IGV position [3] determine or switch bleed select signal from zero [4] to one or from one to zero?

[5] A: What it does is it establishes a value of [6] zero or one, which is used in the determination of [7] that fixed value to keep the bleed control open, [8] even though during the entire time the [9] proportional and integral control signals

are [10] generated and primarily going along.

[11] Q: Does it switch the value from zero to [12] one?

[13] A: It doesn't switch the value, as I [14] understand it that value continues but what it [15] does is it imposes a fixed value on the control [16] bleed value as the signals continue to be [17] generated.

[18] Q: What I'm asking is, the effect on this [19] red line will not effect, the effect of this red [20] line to BCVCTL is whether it's zero or one?

[21] A: This BCVCTL continues to function and [22] operate. What this determines is if there is an [23] additional set value, fixed value which is used to [24] generate, I know I think it's a ten volt signal,

Page 701

[1] which then goes to the bleed control valve and [2] fixes it open to keep it in this high flow [3] position so that it does not because of the [4] compressor characteristics, the flow [5] characteristics of this compressor.

[6] So it does not mistakenly identify [7] that it finds itself in a low flow condition.

[8] Q: That's a function of whether this bleed [9] select value is zero or one?

[10] A: This value of zero or one is used in [11] determining if the fixed value is to be imposed.

[12] MR. HERRINGTON: My colleague [13] suggested a microphone so that I could be heard. [14] Is there one available?

[15] Q: Stepping back, Mr. Muller, what is the [16] event that adjusts the relationship between the [17] magnitudes of said integral and proportional [18] control signals and the magnitudes of said [19] parameter variations as a function of the position [20] of the inlet guide vanes?

[21] A: I'll wait until you put — it's not fair [22] to answer a question before you are properly mic'd [23] up.

[24] Q: Thank you.

Page 702

[1] Please.

[2] A: As I've said, as I said formally, the [3] value is used for setting the — for invoking a [4] fixed value that will fix the bleed control valve [5] open to make sure it stays under high flow. So [6] the actual surge control system, the BCVCTL signal [7] continues, and it's also available but it effects [8] it because it imposes another value so it's [9] modified in that fashion.

[10] Q: Let me show you another chart. Let me [11] reask the question because I'm not sure you [12] addressed it. What event is it, how do you know [13] that there has been an adjustment between the [14] magnitudes of the integral and

proportional [15] control signals and the magnitudes of the [16] parameter variation signals?

[17] A: How do we know that? In this particular [18] logic, the IGV position among these other measured [19] values generate, generate information which is [20] then used to determine, which is used to determine [21] if the compressor is in high or low flow.

[22] This is going on in parallel with [23] the operation of the proportional and integral [24] controls which operated throughout. And so this

Page 703

[1] is also marching along and making that measurement [2] continuously.

[3] I should also mention, I'm glad you [4] brought up that point because when you are in high [5] flow the proportional and integral controllers [6] continue to operate and measure and continue in [7] fact to function and stay available throughout [8] because since surge and flow can change so during [9] that time automatically on these compressors, as [10] the air demand from the airplane varies, that, and [11] that is — that it must be stand ready at any time [12] to be able to recognize when it falls from a high [13] to a low flow condition, and therefore to assure [14] that the compressor itself will not go into surge.

[15] And so the IGV position plays a [16] critical part in assuring that the surge system on [17] the APS 3200 in fact prevents this catastrophic [18] possibility of a surge compressor impeller [19] failure.

[20] Q: Mr. Muller, with all due respect I think [21] I haven't still heard an answer to any question.

[22] A: I'm sorry. I thought I had answered your [23] question.

[24] Q: What event adjusts the relationship

Page 704

[1] between the magnitudes of the integral and [2] proportional control signals and the magnitudes of [3] said parameter variations?

[4] A: Well, the event is this, that at any [5] given time, the value — here, may I —

[6] Q: Sure, please.

[7] A: At any given time, this value, the value [8] coming out of the closed loop surge control has a [9] specific value. And as the — in the IGV [10] position, it is in parallel independently [11] monitoring where are we on this curve.

[12] When it imposes, when it finds that [13] it's above, it is in a high flow condition, it [14] imposes a value. Now that value, that value is a [15] fixed value which can be very likely different [16]

than the value that has been generated by the [17] surge control.

[18] And therefore you have effectively [19] adjusted them because you have taken it clearly [20] from one value that it was prior to that and now [21] you've established — you've changed, you affected [22] it by changing that value and providing a fixed [23] value.

[24] Q: Maybe you did answer just now. The

Page 705

[1] adjustment is when you switch from low flow to [2] high flow?

[3] A: No, the adjustment is the fact of — it's [4] not that — the adjustment is the fact that you [5] have adjusted the relationship because the [6] relationship — well, perhaps, I'm sorry, I think [7] you basically caught the sense of what I was [8] saying, yes.

[9] Q: So switching from low flow to high flow [10] is the adjustment that satisfies element D?

[11] A: The portion that satisfies element D is [12] not the physical of switching, it is basically the [13] actual adjustment of the values themselves. That [14] is formally — it's a subtle point.

[15] Formally you had a value that was [16] very continuously and while this was going on, [17] this logic here was keeping track of this to make [18] sure it wasn't in the high flow condition. It [19] then — it basically — it basically adjusts this [20] value that is coming out of the surge control [21] based on the IGV position and these measured [22] perimeters as well.

[23] And it adjusted by saying I am now [24] taking, we are now in a situation where that value

Page 706

[1] that I have from here is now adjusted to a fixed [2] value to keep that valve open.

[3] Q: So that happens when the system switches [4] from low flow to high flow, correct?

[5] A: There is an adjustment that is made in [6] the process, at some position, at some location, [7] there is an adjustment made.

[8] In much the same way as you're [9] suddenly — a clever analogy doesn't come to mind [10] at the moment. But basically what you're doing is [11] at some point where the system is continually [12] monitoring where it is on the compressor curve, it [13] is at various times where it says either be [14] careful we're about to go in a low flow value, in [15] the same way that the value is adjusted on the way [16] up when you go into high flow. That is whatever [17] the output is

here.

[18] It says we're now in high flow so [19] let's adjust that value and bring it into fixed [20] value on the opposite side the demand from [21] the aircraft begins to decrease, the actual value [22] is continually being monitored against a [23] continually generated value from the surge control [24] that is being generated from the proportional and

Page 707

[1] integral controllers and then at some point it [2] will adjust the fixed value back to the actual [3] proportional and control value.

[4] So it's continually adjusting the [5] proportional control value depending on the IGV [6] position telling us if we are in high or low flow.

[7] Q: Okay. Mr. Muller, I think I gathered [8] from that that you're saying the adjustment [9] happens when the system determines whether it's in [10] high flow or low flow, the system switches from [11] high flow to low flow?

[12] A: It's part of the process, yes.

[13] Q: And whether you're in high flow or low [14] flow depends on whether zero equals low flow and [15] one equals high flow, correct?

[16] A: That's the way the information [17] conveyed.

[18] Q: Mr. Muller, isn't it a fact that there is [19] another test that's used in the high flow logic, [20] correct?

[21] A: Yes.

[22] Q: One that I think we've hardly talked [23] about so far?

[24] A: That's right.

Page 708

[1] Q: It's this test?

[2] A: Yes.

[3] Q: This test says DELPQP is greater than [4] .35?

[5] A: Yes.

[6] Q: If it's greater than .35 it would change [7] the value of this from zero to one?

[8] A: That's correct.

[9] Q: This test doesn't use inlet guide [10] position at all?

[11] A: That's right.

[12] Q: No role of IGV position?

[13] A: Rigorously, that's not correct.

[14] Q: Well, the calculation of DELPQP is a [15] measurement of two static pressures?

[16] A: Let's take a look at that.

[17] MR. PUTNAM: Your Honor, I do have [18] an objection, Your Honor.

[19] THE COURT: Sustained.

[20] A: It would appear that way. But in a [21] rigorous way, but in a rigorous way, I think that [22] we have to look at this and when you say [23] DELPQP has no relationship to IGV position, well, [24] as I've been discussing throughout the day, it in x574Y

Page 709

[1] fact does in a strong one, in fact.

[2] In fact, it's part and parcel of how [3] the entire compressor is equalled. DELPQP is a [4] value basically the result of a division process [5] that has occurred resulting from the change in [6] pressure divided by the pressure at the discharge [7] of the compressor.

[8] That division which generates this [9] value, which we call DELPQP, well, the change in [10] pressure and the discharge pressure as, especially [11] the change in pressure, is a result of change in [12] flow.

[13] And as we know from the earlier [14] description, the only way you can have a change in [15] flow in the compressor is by changing the IGV, the [16] position of the IGV valves. So in the IGV [17] position — so following it through, as the IGV [18] position changes, it changes the flow, which [19] changes the value of pressure, divided by the [20] pressure, which generates DELPQP which is a [21] function of, in and, the change in the IGV [22] on.

[23] And then we use that — and then we [24] use that — you've taken my poster.

Page 710

[1] And we use that value to, a value of [2] .35 which goes back to a compressor curve, which [3] has been generated by Turbomeca where they — [4] where they went from the curve itself has been [5] generated from minus — from minus 15 degrees IGV [6] position to plus 82 degrees IGV position.

[7] And that curve has been — is a [8] function of IGV position, the value of DELPQP [9] comes from the — a flow generated by the APS [10] 3200, which is a function of IGV position, and [11] that in turn finally is what is used in this test.

[12] So technically, I mean truly as an [13] engineer, it is from a rigorous standpoint. It is [14] very difficult to say that DELPQP has no [15] relationship, the IGV itself has a very strong [16] relationship.

[17] Q: Sure, but not as a matter of controlled [18] logic. We're talking about controlled logic [19] here.

[20] PUTNAM: Objection, Your Hon-

[21] THE COURT: Sustained. Ask a [22] question.

[23] Q: The value of DELPQP depends on the demand [24] from the aircraft?

Page 711

[1] A: Yes.

[2] Q: DELPQP measures the physical flow, or [3] what you call the physical flow through the [4] parameter through the compressor?

[5] A: DELPQP doesn't know a thing about the [6] flow demand from the aircraft. It's a very dumb [7] measurement. It only knows a few things.

[8] And those things that it knows [9] basically is it knows this, that DELPQP knows this [10] calculation. That's all it knows. It couldn't [11] have an idea of what went on before. It's very [12] focused and it just focuses on this, and this in [13] turn is a function of IGV position.

[14] The fact that IGV position is a [15] function of the aircraft load is true and is very [16] interesting, but in the end DELPQP is not aware of [17] it. But DELPQP is directly, as far as a measured [18] quantity, the only way that a compressor demand [19] can ever be incorporated or recognized by the APS [20] 3200 is IGV position because the IGV position, if [21] that IGV position did not fail in some fashion, [22] that is it got stuck, IGV is occasionally to stick [23] and the load demand changed from the aircraft, [24] DELPQP would never know about it.

Page 712

[1] It would never know that the [2] aircraft demand changed because the only way it [3] could know that is because the position of the IGV [4] has to change.

[5] Q: Mr. Muller, let's get back to figure 12. [6] We've talked about what makes the adjustment [7] between high flow and low flow, and what you've [8] talked about is supporting your conclusion of [9] infringement is this part of the high flow logic, [10] correct?

[11] A: Yes.

[12] Q: And you've said, I believe, correct me if [13] I'm wrong, that the switch between zero and one is [14] what makes the adjustment that satisfies element [15] D?

[16] A: What I said is that it is part — it is [17] the means by which the actual adjustment, the [18] actual adjustment between those — those [19] relationships is actually affected. This goes [20] into the determination of when that adjustment is [21] made.

[22] Q: And let's just be clear. This is the [23] test that switches the system from zero to one, [24] correct?

Page 713

[1] A: That is one of the tests.

[2] Q: Is it your understanding of the facts

[3] that this other test is sometimes what switches [4] the system from zero to one?

[5] A: I believe, am I confusing something [6] here?

[7] Q: No, I just want to clarify, that is your [8] understanding?

[9] A: This is what it says here, it says — it [10] has a choice, there is a logic here that [11] determines this is what it uses. And if this [12] condition is not satisfied, then that condition is [13] used. Yes.

[14] Q: So it is your understanding that this [15] test that uses IGV position sometimes switches the [16] system from zero to one?

[17] A: This entire circuit results in whatever [18] manner the measurements are made and whatever [19] logic is used, in the end, at the end of the day, [20] or the end of a second, it comes out and says here [21] am I in high flow or am I in low flow.

[22] Q: I want to be clear, your understanding is [23] that this test that uses IGV position is sometimes [24] responsible for moving the value of bleed select

Page 714

[1] from zero to one?

[2] A: What it does is provides the information, [3] it provides the information which makes the [4] adjustment between the — between the PMI Controls [5] and the fixed value.

[6] Q: Let's be clear. Isn't it true that this [7] is the only test this ever switches the system [8] from zero to one?

[9] A: This is the only test?

[10] Q: Yes.

[11] A: But that's not what's shown here.

[12] Q: So that's not your understanding?

[13] A: My understanding is what is indicated in [14] the ECB, the actual control document for the APS [15] 3200. And that is what my understanding of how [16] the APS 3200 works.

[17] Q: Just to be clear, the factual [18] understanding that you've been working with is [19] that this is not the only test that switches the [20] system between zero and one?

[21] MR. PUTNAM: Objection.

[22] THE COURT: Sustained. He's [23] answered that question a number of times.

[24] MR. HERRINGTON: I just wanted to be

Page 715

[1] very clear. Okay. Thank you.

[2] BY MR. HERRINGTON:

[3] Q: The record isn't clear. This test is [4] DELPQP is greater than 0.35, and I've asked [5] whether that is the only test that switches the [6] system between zero and

one.

[7] THE COURT: Your next question.

[8] MR. HERRINGTON: I think that's all [9] I have with this chart for now. We can resume our [10] seats.

[11] THE COURT: You can resume the [12] stand, Mr. Muller. Don't worry about that, he'll [13] take care of it. You're working hard enough.

[14] MR. PUTNAM: If I can move it, Your [15] Honor, so the jury can see the witness.

[16] THE WITNESS: Thank you, John.

[17] BY MR. HERRINGTON:

[18] Q: Mr. Muller, the '893 and the '194 patents [19] that we're working with, they claim a particular [20] surge control —

[21] A: I'm sorry, before I answer your question, [22] I'm sorry to interrupt, but my batteries have run [23] out and I thought while we're here, in case I have [24] to go down again, if the clerk would be so kind as

Page 716

[1] to — thank you.

[2] Q: Actually, before we go back, I would like [3] to ask you to talk about something, the second to [4] last thing you talked about, and that's the [5] comparators in claim 19. If we could please, [6] project that claim.

[7] And I'm sorry to ask you to come [8] down, but if you could show me wherein element C, [9] if you could highlight that?

[10] A: If we could wait a minute until I get my [11] batteries. I need my voice as well.

[12] MR. PUTNAM: I'm sorry, Your Honor, [13] just as a matter of form should I ask your [14] permission?

[15] THE COURT: Please, just go ahead.

[16] MR. PUTNAM: Thank you, Your [17] Honor.

[18] BY MR. HERRINGTON:

[19] Q: Element C states an adjustable set point [20] comparator having an input portion coupled to said [21] output portion of said sensing — an adjustable [22] set point comparator having an input portion [23] coupled to said output portion of said sensing [24] device, and an outlet adapted to generate an error

Page 717

[1] signal.

[2] And if you could, please, [3] Mr. Muller, show me where that comparator is?

[4] A: And your question was, where is the [5] comparator?

[6] Q: Yes, sir.

[7] A: Let me just go through it again, the [8] adjustable set point comparator having an input [9] portion coupled to said

output portion of said [10] sensing device, and an outlet adapted to generate [11] an error signal, I think what I was talking about [12] is this right here. There is an adjustable set [13] point. This is what it's referring to, having an [14] output portion of said sensing device, that is [15] referring to that, to generate an error signal, [16] generating that.

[17] Q: If we could go to element G. And element [18] G states a guide vane position sensor and a [19] function generator coupled in series between the [20] inlet guide vanes and said input portion of said [21] comparator.

[22] And now let me ask you, first of [23] all, you understand the phrase "said comparator," [24] does that refer back to the comparator that's

Page 718

[1] already been defined?

[2] A: What — it depends on what doctrine you [3] want. On the literal or equivalent doctrine?

[4] Q: Well, talking about what the claim [5] actually means?

[6] A: Well, on a literal basis, you'd be [7] correct. On a literal basis that's what it [8] means. But I recall saying at the time that on an [9] equivalent basis that it is performing this [10] function, this function here — may I —

[11] Q: Sure.

[12] A: It is performing this function here is [13] the equivalent of this comparator as far as how it [14] performs.

[15] Q: I did want to be clear about that. It [16] says said comparator, but you're pointing to a [17] different comparator than you pointed to earlier?

[18] A: That's right.

[19] Q: All right. Thank you.

[20] A: Should I return to —

[21] Q: Yes, please.

[22] Mr. Muller, the '893 and '194 [23] patents claim a particular control logic for surge [24] control, a surge control system of a compressor?

Page 719

[1] A: Yes.

[2] Q: And you've only designed a surge control [3] system once, is that correct?

[4] A: I have designed a surge control system [5] once, but that was only — that was only a special [6] circumstance.

[7] What I do is I evaluate surge [8] control systems which I've done for decades.

[9] Q: In terms of designing a surge control [10] system, that's only happened once?

[11] A: Yes, that only occurred once.

[12] Q: And that was 30 years ago?

[13] A: And that was not intended, that was not [14] intended, that was an instance where I designed [15] one because we were under an emergency condition [16] "emergency" meaning that we were trying to start [17] a piece of equipment up, so we had something that [18] was manual. It didn't work, and so me and my team [19] designed a surge control system in a matter of a [20] day or two and were able to get it implemented and [21] operating.

[22] But that was an exceptional [23] condition. Normally, my involvement in surge [24] control systems has been in the evaluation of

Page 720

[1] surge control systems, in compressor systems [2] ranging with all types of compressor, gas turbine [3] operations, as well as steam turbines and motor [4] drives and so on.

[5] Q: Okay, Mr. Muller, you talked quite a bit [6] about the history of surge control and APUs?

[7] A: I talked about APUs and surge control [8] systems, yes.

[9] Q: And before this case, you've never worked [10] on an APU?

[11] A: That's right.

[12] Q: Now, I would also like to talk to you [13] about what you know about the APS 3200, the [14] accused product here. You've never examined an [15] APS 3200?

[16] A: That's correct.

[17] Q: And you've obviously never tested an APS [18] 3200?

[19] A: That's right.

[20] Q: So for your analysis in this case there [21] is no need to test or examine an APS 3200?

[22] A: The — in fact, you might even go [23] further, I have not examined the Honeywell [24] machine, either.

Page 721

[1] My judgements have been based on the [2] actual physical descriptions that are provided in [3] the patents, which I believe is what really — [4] what really is at issue and all of the information [5] regarding the surge control system from the APS [6] 3200, which has been provided by Sundstrand, and [7] using those descriptions of a surge control system [8] in the patent and the operation, and the [9] operational and engineering specifications and all [10] the documentations and depositions from experts by [11] Sundstrand who know the system implicitly, I've [12] been able to arrive at the conclusions which I [13] have.

[14] Q: Is it fair to say that you can't tell how [15] a surge control logic works just from operating [16] the APS 3200?

turn to HSB 401574.

[3] A: Yes. I'm saying yes, I'm at 574, but I
[4] don't know what's there.

[5] Q: Okay.

[6] A: May I have a moment to look at
this?

[7] Q: Certainly. Please.

[8] A: Yes.

[9] Q: Turning back to HSB 401570, that's
a —

[10] A: Yes.

[11] Q: At the bottom that states, "Can-
celed [12] claims 48 and 49."

[13] A: Yes.

[14] Q: That means those claims were
canceled?

[15] A: I don't — based on what's said
here, [16] yes.

[17] Q: Comparing the canceled claims to
the [18] allowed Claim 4, you see that the
only difference [19] is the language re-
lating to the use of the inlet [20] guide
vane position; correct?

[21] A: I have to take — I take your word
for [22] that.

[23] Q: Okay.

[24] A: I mean, I've seen this before and
I'm

Page 729

[1] looking at it and noting yes, that's the
point [2] you're making and that clearly
appears to be the [3] difference, yes.

[4] Q: And it's the language relating in
Element [5] D to the use of in the inlet
guide vane position [6] that is what
Hamilton Sundstrand believes is not [7]
present in the APS 3200?

[8] A: Yes.

[9] Excuse me, do you wish me to stay on
[10] page —

[11] Q: No, that's all.

[12] Mr. Muller, do you have a copy of —
[13] let me hand to the witness Exhibit 2,
the '893 [14] patent.

[15] Mr. Muller, you've taken a position [16]
that what the APS 3200 does is it adjust
the set [17] point based on inlet guide
vane position, it does [18] the equivalent
of that?

[19] A: Yes.

[20] Q: Now, you agree that the '893
patent [21] specifically defines what the
set point means?

[22] A: It defines it in part, yes, part of it [23]
defines it, yes.

[24] Q: Why don't you turn to column
two, line

Page 730

[1] 60.

[2] THE COURT: What line was that, [3]

Mr. Herrington?

[4] MR. HERRINGTON: Column two, line
[5] 60.

[6] BY MR. HERRINGTON:

[7] Q: It states, "Additionally means are [8]
provided for automatically resetting the
desired [9] value or set point of the flow
parameter as a [10] function of the
position of the load compressor [11] inlet
guide vanes." Is that what it says?

[12] A: That's what it says.

[13] Q: So it's the desired value of the
flow [14] parameter?

[15] A: That's what it says in the des-
cription, [16] yes.

[17] Q: And akin to the set point of a
cruise [18] control system would be the
desired speed of the [19] cruise control
system?

[20] A: A desired set point, a desired value
in a [21] cruise control system is whatever
speed you set it [22] for.

[23] Q: Now, in the APS 3200, the desired
value [24] of what you call the flow-
related parameter is not

Page 731

[1] adjusted based on the inlet guide vane
position?

[2] A: I'm a little confused as to your
question [3] because while the des-
cription is interesting, I [4] think it was
told to us at the beginning and while [5]
described to me, while this is all very [6]
interesting statements and expands on
some of the [7] background and so on, the
issues at hand have to [8] do with what's
specifically stated in the claim.

[9] My comments go to what is claimed in
[10] the patent. What various — there are
various [11] descriptions in the patent
itself on background [12] and so on which
are interested and kind of flesh [13] out
what the background is, but my un-
derstanding [14] of patents, the limited
understanding that I have, [15] says that
the only thing at issue here is what is [16]
claimed.

[17] Q: Why don't we look at a patent
claim, [18] then, Mr. Muller.

[19] A: Okay.

[20] Q: If you turn to column 11, beg-
inning at [21] line 52.

[22] A: You've given me the wrong copy,
by the [23] way. My copy has your notes
on it as to what [24] you're going to ask
me. I can't cheat.

Page 732

[1] Q: Do you have a clean copy?

[2] A: No, I don't.

[3] THE COURT: I have one.

[4] MR. KRUPKA: And Mr. Herrington, if
[5] you would like to have a clean copy,

we have one [6] for you, too.

[7] MR. HERRINGTON: Okay.

[8] A: Before you ask another question,
might I [9] have some more water, please?

[10] Q: Sure.

[11] If you could, please, turn to [12]
Element E, that's on column 12, line four,
I [13] believe it is. And that states, "
Comparator means [14] for receiving said
sensing means output signal and [15]
generating an error signal representing
the [16] difference between the sensed
value of said [17] parameter and a desired
value thereof."

[18] Do you see there, said comparator [19]
means having an adjustable control set
point [20] representing said desired value
of said parameter?

[21] A: I need a clarification on this. Is this
[22] claim one of the claims at issue here?

[23] Q: Claim 8?

[24] A: No, Claim 12. Is it Claim 12?

Page 733

[1] Q: No, column 12.

[2] A: Column 12. I'm sorry, I thought you
[3] meant Claim 12.

[4] Q: Do you see the language there?

[5] A: Be so kind as to repeat your ques-
tion, [6] please.

[7] Q: Okay. Element E, states, "Com-
parator [8] means for receiving said
sensing means output [9] signal and
generating an error signal representing
[10] the difference between the sensed
value of said [11] parameter and a desired
value thereof, said [12] comparator means
having an adjustable control set [13] point
representing said desired value of said
[14] parameter."

[15] That's referring to the desired [16]
value of the flow-related parameter;
correct?

[17] A: Yes, that's correct.

[18] Q: And it may be helpful at this point
to [19] look at figure 12a which we've
been looking at [20] together. Would you
mind stepping down?

[21] A: Of course. I think after doing this,
we [22] could start a talk show after this.

[23] Q: As I believe you said earlier, this is
[24] the comparator that would relate to
what is

Page 734

[1] claimed in Claim 8; correct?

[2] A: That's correct, yes.

[3] Q: And the desired value of the set
point is [4] this line right here?

[5] A: You're pointing to SRGSPT going
back to [6] curve, T 2 versus surge set
point, yes.

[7] Q: And, in fact, SRGSPT means surge
set [8] point?

[9] A: That's right.

[10] Q: Okay. Now, I'm sorry if you could get [11] your copy for the patent so we can refer to it.

[12] So the desired value of the [13] flow-related parameter, and we disagree about [14] whether it's flow-related parameter, but the [15] desired value is represented by surge set point?

[16] MR. PUTNAM: Objection to the [17] question.

[18] THE COURT: Basis.

[19] MR. PUTNAM: There is an argument [20] in the question.

[21] THE COURT: Could you rephrase.

[22] MR. HERRINGTON: Sure.

[23] Q: Desired value of the parameter is [24] represented by surge set point?

Page 735

[1] A: That is my understanding.

[2] Q: And if we look at element F, Claim 8, it [3] says, "Means for transmitting to said comparator [4] means a reset signal for varying said set point as [5] a function of position of said inlet guide vanes [6] in accordance with a predetermined reset [7] schedule."

[8] Correct? Is that a fair reading?

[9] A: Yes.

[10] Q: Now, this is not adjusted as a function [11] of inlet guide vane position; [12] is it?

[12] A: This is — this surge set point is a [13] function of temperature.

[14] Q: Okay. So it is adjusted?

[15] A: This point, yes, is adjusted.

[16] Q: But as a function of temperature?

[17] A: It's a function of — well, yes and [18] what it refers to on this table is it's really [19] what — it depends how you want to look at this.

[20] Temperature is used for the [21] determination of where will the surge set point [22] be. These values, 245 measured minus 42 degrees [23] is associated with starting this at 20,000 feet. [24] Minus seven degrees, a cold day. 59 degrees.

Page 736

[1] which is the national standard day for purposes, [2] and 88 degrees, which is the lassic hot day.

[3] These four, these four standard [4] values are associated with a surge set point which [5] comes from the flow curve, where you have DELP [6] over P is measured across this curve and this [7] curve which has been generated as a function of [8] varying IGV angles, what we have is in order to [9] accommodate — really the way — the way I look at [10] it is am really — this is the value I'm using.

[11] This is a reference. This is a value that I [12] really use.

[13] And that value of surge set point [14] which you've obtained from this flow curve, from [15] this flow curve which is generated as we vary the [16] IGV angles from minimum to max, you basically are [17] saying well, in order to accommodate the fact that [18] I know there will be an adjustment made with [19] temperature of the actual flow off this curve, I [20] then basically allow these four various settings [21] that I can use to make a comparison based on what [22] the temperature is.

[23] So both temperature, temperature and [24] the actual flow values are used which were part of

Page 737

[1] the overall flow curve.

[2] THE COURT: Are we ready to take our [3] afternoon break at this time?

[4] MR. HERRINGTON: Sure. Thank you.

[5] THE COURT: Members of the jury, [6] we'll retire for our afternoon break.

[7] (A brief recess was taken.)

[8] THE COURT: The jury is on the way. [9] The jury has agreed we're going to go to five [10] today.

[11] (Jury entering the courtroom at [12] 3:40 p.m.)

[13] THE COURT: Good afternoon again, [14] members of the jury. I have advised counsel of [15] your good graciousness and your willingness to [16] work until 5:00 today, so the Court appreciates [17] it. We will go to 5:00 today.

[18] BY MR. HERRINGTON:

[19] Q: Mr. Muller, I think we left off talking [20] about the '893 patent and comparing it to figure [21] 12a, so maybe we should go back and continue [22] talking about that.

[23] A: This?

[24] Q: Yes, please. Thank you.

Page 738

[1] Just to go back to what we said [2] earlier, element E talks about a comparator means [3] having —

[4] A: I'm sorry, I've lost track. Where are [5] we? Where did we leave it off?

[6] Q: Element E of Claim 8?

[7] A: Element E of Claim 8. I'm with you.

[8] Q: And element E talks about a comparator [9] means having an adjustable control said point [10] representing said desired value of said [11] parameter.

[12] And we agreed that this is the set [13] point that would be meant by Claim 8, element E?

[14] A: That's correct.

[15] Q: And then when we left off, we

were [16] talking about the fact that that set point is [17] adjusted as a function of temperature?

[18] A: Yes. Well, that's what you had said. I [19] had added to it the fact that from my standpoint, [20] I saw it really basically as a — these were the [21] points that are on the flow parameter curve which [22] was generated by Turbomeca, and where various [23] points have been picked off to accommodate for [24] certain standard temperatures.

Page 739

[1] Q: So what happens is that the temperature [2] is measured, that's fed into this box that says [3] surge set point on this line and T2 F on this [4] line, and then what comes out of it is the surge [5] set point?

[6] A: That is right. What this curve — what [7] this curve does is, is it has plotted on here [8] points from the flow curve that was generated so [9] that you could pick off various points, yes.

[10] Q: So to find out what set point is, you [11] look at temperature?

[12] A: Temperature is what is used to be able to [13] work this graph as it's set up here, yes.

[14] Q: And that is the desired value of the [15] parameter that's going to be maintained by the [16] 3200 system?

[17] A: That's correct.

[18] Q: Okay. So —

[19] A: Well, it's the desired value which is [20] used to determine as far as the surge set point is [21] concerned as to where you want to be, yes, [22] correct.

[23] Q: Correct, that's where you want to be?

[24] A: Yes.

Page 740

[1] Q: Claim F — element F of Claim 8 states, [2] "Means for transmitting to said comparator means [3] a reset signal for varying said set point as a [4] function of the position of said inlet guide vanes [5] in accordance with a predetermined reset [6] schedule."

[7] What I want to ask is: Looking at [8] this, it's the temperature that varies the value [9] of the set point according to a predetermined [10] schedule?

[11] A: That's correct, yes.

[12] Q: So as far as what Claim 8 talks about, it [13] is literally satisfied if it were to talk about [14] temperature?

[15] A: Yes, if it were to talk about [16] temperature, it would be, yes.

[17] Q: Thank you.

[18] Now, looking at figure 12a, there is [19] a comparison between the actual value of the [20] static pressure parameter and

the desired value; [21] is that fair?

[22] A: What do you mean by the static pressure, [23] this is not the static pressure parameter.

[24] Q: What was called DELPQP. The actual value

Page 741

[1] of DELPQP?

[2] A: You mean the flow parameter?

[3] Q: Why don't we agree on the exact term [4] that's used here, DELPQP?

[5] A: Oh, yes.

[6] Q: So it's the comparison of the actual of [7] DELPQP and a desired value; is that fair?

[8] A: Yes.

[9] Q: And that then is compared in this what we [10] call a "comparator"?

[11] A: Yes.

[12] Q: The output is an error signal?

[13] A: Correct.

[14] Q: That would represent any difference [15] between the actual value and the desired value?

[16] A: That's correct.

[17] Q: Then that's what generates the [18] proportional integral control signals?

[19] A: That is what is used by the proportional, [20] the proportional integral controller in order to [21] generate the signal, it doesn't generate it.

[22] These are continuing functions that [23] get a signal coming in, so they don't — it [24] doesn't generate it. It's waiting to get that

Page 742

[1] information in so it can spit out information to [2] control the BCV valve, the bleed control valve.

[3] Q: So figure 12a shows us how the [4] proportional integral control signals are [5] generated in the 3200?

[6] A: What it shows is it shows the series of [7] events from measured values, from the, how it's [8] compared against desired value, the generation and [9] error, the error signal which is then processed by [10] the proportional and integral control to form a [11] signal.

[12] It's not just showing this or that. [13] This is showing everything. It shows a complete [14] system. This is a system process and I can't say [15] it's showing you this or that.

[16] Q: Well, it shows how — why don't we look [17] at this, BCVCTL is the command that would actually [18] move the valve, the bleed valve in the 3200?

[19] A: This is the signal which eventually gets [20] used, which eventually gets used with the bleed [21] valve controller in order to activate

[22] Q: So if the bleed valve is ever actually [23] moved from one position to the other, it's going [24] to be because of BCVCTL?

Page 743

[1] A: It's going to be because of BCVCTL, as [2] well as, and/or this.

[3] Q: Okay. Let's go back to BCVCTL for a [4] moment.

[5] A: When is this, what I'm referring to to [6] answer your question more fully, the bleed control [7] valve, its movement will be determined by the — [8] by this circuitry here, and/or it will be [9] determined by the result of the IGV position [10] determining if it's high or low flow because high [11] flow, as you know, it will take control and move [12] it or it will dictate that it — that the surge [13] control system goes to a maximum opening of the [14] bleed control valve.

[15] Q: Why don't we leave that on the screen [16] because you said a few things I want to follow-up [17] on.

[18] For one thing, does switching the [19] system into high flow cause the bleed valve to [20] actually move?

[21] A: It's not — we're not talking about [22] switching, what it does is it provides — it [23] provides the information to establish where the [24] high and low flow is, as I indicated earlier.

Page 744

[1] where — so that as the proportional and integral [2] controller continually generates the signal used [3] to determine where the bleed control valve is.

[4] Meanwhile, while this is going on in [5] parallel with that effort, this rate of 25 to a [6] hundred times a second, the IGV position is being [7] used to continually check to see if it's in high [8] or low flow condition.

[9] And when it is in high flow [10] condition, it says it modifies or it adjusts the [11] proportional and integral control signal to give a [12] constant value to the bleed control valve so it [13] stays open to the aircraft in a fixed position.

[14] Q: Picking up on something you just said, [15] the proportional and integral control signals that [16] are generated, they're never ever adjusted, [17] they're either not used or used, correct?

[18] A: They are — they are part of the surge [19] control system which is used in controlling the [20] bleed control valve.

[21] I think it's fairly clear that you [22] have a continual, this is a continual generation [23] of a signal by the proportional and integral [24] control system, that because of the unique

Page 745

[1] characteristics, the special char-

acteristics I [2] should say of the Sundstrand compressor, the IGV [3] position also has to be used here in order to fix [4] — in order to adjust this value, in order to [5] control the bleed control valve.

[6] I think I've described it several [7] times already.

[8] Q: I just want to —

[9] The value of the proportional [10] integral control signals is not adjusted up or [11] down, correct?

[12] A: Well, as far as the bleed control valve [13] is concerned, which is customary for all this, [14] this is all very interesting but the bleed control [15] valve is the business end of the surge control [16] system. And as far as it's concerned, the signal, [17] the proportional and integral control signal is [18] adjusted, is adjusted by the fact if it's in high [19] or low flow.

[20] So as far as it's concerned, that [21] signal is adjusted because that's what it sees.

[22] Q: Well, what actually happens, if you [23] agree, is that a different signal is supplied to [24] the bleed control valve; correct?

Page 746

[1] A: There is — you are generating here [2] continuously, every 25 to a hundred times a second [3] you are generating a new signal. And this also [4] has different signals.

[5] It never has a constant signal [6] unless you impose one. And the only time it gets [7] a constant signal is that because of the [8] characteristics of the way that Sundstrand has [9] chosen to measure flow, it has — it imposes a [10] value to keep that valve open when it's at high [11] flow, which I think we have pretty well gone [12] around on for a while now.

[13] Q: I'm just trying to be clear with what [14] happens with the PI signal. The actual magnitude [15] to the proportional and integral control signals [16] don't change?

[17] A: Of course it does.

[18] Q: As a result of being in high flow or low [19] flow?

[20] A: It does, it's continually being [21] calculated. It doesn't go away. No one says, [22] let's plug it out and take it out and then we'll [23] plug it back in.

[24] This process continues, it

Page 747

[1] continues, and while it's in high flow it [2] continues. And the reason it continues is because [3] at anytime within a fraction of a second, the load [4] from the aircraft could suddenly drop. And as it [5] drops, this part of the circuit must be ready to [6] immediately take control to prevent the